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Prostenus lugubris.

P. sat obscure niger, corpore infra pedibusque chalybeato-violaceis, illo fortiter punctato; prothorace valde transverso. Long. 5 lin.

Hab. Brazil (Morro Velho).

Black, rather opaque, body beneath and legs dark violet; head closely punctured; prothorax much broader than long, very closely punctured, each puncture with a small white scale at the base; scutellum cordiform; elytra minutely seriate-punctate, gradually broader posteriorly; antennæ black, coarsely punctured, the joints only moderately dilated, eighth, ninth, and tenth the most dilated; femora moderately clavate.

In outline and general appearance this species may be approximated to *P. periscelis*, but, *inter alia*, is at once distinguished by its broad prothorax.

V.—*Summary Report upon a Zoological Exploration made in the Mediterranean and the Atlantic on board the 'Travailleur.'*

By M. A. MILNE-EDWARDS*.

FURNISHED with every thing necessary for scientific investigations, the 'Travailleur' quitted Rochefort on the 9th June last, and only returned there on the 19th August. During these seventy days of navigation, in which we traversed more than 2000 sea-leagues, we were in harbour only for the time strictly necessary for taking in coals and provisions at Cadiz, Marseilles, Villafranca, Ajaccio, Oran, Tangier, Lisbon, and Ferrol. All our time was employed in making soundings and dredgings; but we shall refer in the first place only to those executed in the Mediterranean, afterwards taking up those of the Atlantic.

The first methodical investigations made at a considerable depth in the Mediterranean date from 1841, and are due to the naturalist Edward Forbes, who confined them to the Ægean, and did not get below a depth of 300 metres. In 1870 the 'Porcupine' only dredged upon the north coast of Africa; in 1875 M. Marion, off Marseilles, could not investigate the sea beyond 350 metres; and thus the greatest depths remained almost unexplored; and it was to their study that we devoted a part of the month of June and the whole of July.

* Translated by W. S. Dallas, F.L.S., from the 'Comptes Rendus,' 28th November and 5th December 1881, pp. 876 and 931.

In this way we accumulated rich collections, which were immediately submitted to investigation.

M. L. Vaillant undertook the examination of the Fishes and Sponges; M. E. Perrier took charge of the Echinoderms; M. Marion of all the other zoophytes and the Annelids; M. P. Fischer of the Mollusca; Dr. Jullien of the Bryozoa; M. Terquem of the Ostracoda; M. de Folin and M. Schlumberger of the Foraminifera and the Radiolaria; and M. Certes of the Infusoria and some other Protozoa. I reserved to myself the investigation of the Crustacea. M. Stanislas Meunier has determined some of the rocks torn by the dredge from the bed of the sea; and, finally, M. Périer, Professor in the School of Medicine and Pharmacy at Bordeaux, is to analyze the samples of the bottom. In the summary report, which I now lay before the Academy, I merely indicate the results obtained by the naturalists whose names I have just mentioned; it will therefore be easy to recognize the part that belongs to each of them.

As was the case last year, our dredgings only furnished us with a few fishes. At depths not exceeding 450 metres we took some Gobies, *Phycis mediterranea*, and several specimens of *Plagusia lactea*, a very rare species of Pleuronectidæ; finally, at a distance of a few miles from Marseilles, at a depth of 1068 metres, the tangles brought up *Argyropelecus hemigymnus*.

A great number of Crustaceans which were known only from the Atlantic also inhabit the abysses of the Mediterranean. We have ascertained the existence there of *Lisognathus* (*Dorynchus*) *Thomsoni*, Norman, which is so abundant in the Bay of Biscay; of the *Geryon* which we had previously captured in the submarine valley of the north of Spain, which must be distinguished from the Norwegian *Geryon tridens*, and to which we have given the name of *Geryon longipes*; and of *Ebalia nux*, Norman; *Cymonomus* (*Ethusa*) *granulatus*, Norman; *Munida tenuimana*, Sars; *Calocaris Macandréi*, Bell; and *Lophogaster typicus*, Sars. Off Toulon, at 455 metres, we captured two new Oxyrhynchi, one of them belonging to the genus *Heterocrypta* of Stimpson (*Heterocrypta Marionis*, A. M.-E.), which previously included only three species, two belonging to America, and the third to Senegambia. The second is not very far from *Amathia*; we have called it *Ergasticus Clouei*, to commemorate at once the name of our ship* and that of Admiral Cloué, whose cooperation was most useful to our expedition.

* From ἐργαστικός, laborious.

At the same depth, off Planier, we obtained a new species of the genus *Galathodes*, so abundantly represented in the great depths of West-Indian sea, and the existence of which in the Bay of Biscay we ascertained in 1880. This *Galathodes* (*G. Marionis*), like its congeners, is blind; its eyes exist, but have no pigment.

Among the Mollusca some remarkable species dredged at 550 metres within sight of Marseilles deserve to be cited, such as *Pholadomya Loveni* of the coast of Portugal, *Limopsis aurita*, *Terebratella septata* of the Pliocene of Sicily, and a new species of *Nassa*. We give also a list of the species found at this depth*.

Between 500 and 2600 metres there are formed at certain points enormous accumulations of empty shells, Pteropods, and pelagic Heteropods, over a bed of very fine mud, in which live species of *Nucula*, *Syndesmya*, *Leda*, *Nassa*, *Siphonentalis*, and *Dentalium*; specimens of *Xylophaga dorsalis*, a species which often attacks the gutta percha of the telegraphic cables, are lodged in the fragments of drift-wood. On the shore of Morocco we collected *Modiola lutea*, a species discovered in 1880 in the Bay of Biscay. Lastly, the sand and mud of the Barbary coast are full of small *Marginellæ*, such as characterize the shelly bottoms of Spain and Portugal.

The investigation of the Bryozoa of the great depths has been hitherto almost entirely neglected; and hence Dr. Jullien has found in the collections made by us many remarkable species which establish a passage between the fauna of the Mediterranean and that of the Atlantic. Some of them were previously represented only by forms regarded as peculiar to the Cretaceous deposits.

The Cœlenterata include some interesting types; and their study has revealed facts which deserve mention. The Zoantharia Malacoderma only furnished a large *Ilyanthus* with long non-retractile tentacles. The Corallaria are not numerous. *Caryophyllia clavus* was taken down to a depth of 300 metres. *Dendrophyllia cornigera* appeared off Ajaccio, forming banks at 540 metres; to its branches were attached

* PTEROPODA: *Hyalea tridentata*, *H. vaginellina*, *Cleodora lanceolata*. HETEROPODA: *Carinaria mediterranea*. GASTEROPODA: *Trophon vaginatus*, *Chenopus Serresianus*, *Nassa limata*, *N. Edwardsii*, sp. n., *Emarginula fissura*, *Ringicula leptochila*. SCAPHOPODA: *Dentalium agile*, *Siphonentalis quinquangularis*. LAMELLIBRANCHIATA: *Limopsis aurita*, *L. minuta*, *Arca pectunculoides*, *Malletia cuneata*, *Nucula sulcata*, *Pecten influens*, *P. Hoskynsii*, *Astarte sulcata*, *Isocardia cor*, *Venus multilamella*, *Neera cuspidata*, *N. abbreviata*, *Syndesmya longicollis*, *Pholadomya Loveni*. BRACHIOPODA: *Terebratella septata*, *Terebratula vitrea*, *Terebratulina caput-serpentis*.

some *Caryophyllia* identical with those collected in the Atlantic by the 'Travailleur.' Several specimens of *Desmophyllum crista-galli*, resembling those of the Bay of Biscay, were collected by the 'Charente' upon the telegraph cable at 450 metres; they were associated with *Caryophyllia clavus* and with *Caryophyllia electrica*, A. Milne-Edwards, which Duncan has lately redescribed under the name of *C. Calveri*. The coralligenous station of Cape Sicié (50-80 metres) gives shelter to numerous Annelids; but nearly all of them have already been indicated off Marseilles; one of them, *Serpula crater*, has been met with upon the telegraph cable down to a depth of 1800 metres. We may also notice a small Gephyrean which has not previously been found in the Mediterranean, namely *Ocnosoma Steenstrupii*, the usual companion of the *Brisingæ* in the Atlantic.

On two different occasions the dredge brought up specimens of *Brisinga*, which were certainly not numerous, and were of small dimensions when compared with those of the Atlantic; but the presence in the Mediterranean of this magnificent starfish, which has hitherto been thought peculiar to the cold and deep regions of the ocean, is an entirely unexpected fact. Our *Brisingæ* were obtained between 550 and 2660 metres. We may also cite *Archaster bifrons*, which was supposed to be peculiar to the Atlantic, and a new species of *Asterias* (*A. Richardi*, Perrier), taken at 540 metres, endowed with the faculty of reproducing by the division of its body into two parts.

During the whole of the expedition we collected samples of the bottom, which were treated with osmic acid and placed in well-closed tubes, to be afterwards submitted to the examination of M. Certes. It was indeed interesting to ascertain whether Infusoria resembling or of different form from those of the surface lived in the great depths. These organisms, however, were not met with; the soft Rhizopods, or those with chitinous carapace, which occur at the surface of the sea, are rare; finally, the examination of the finest granules never betrayed the existence of *Bacteria* or other Microbia. A sounding made between Nice and Corsica, at 2660 metres, furnished several small *Actinophryes*.

The study of the Foraminifera is far from being completed; but the results already obtained show the variety of the species, and the existence of numerous oceanic types and forms known in the fossil state. One Foraminifer especially is of much interest, because, when young, it displays the form of a *Cristellaria*, and subsequently that of a *Nodosaria*. M. Schlumberger has described it under the name of *Amphicoryna*.

The Sponges are not at all abundant at great depths.

Beyond 600 metres and down to 2660 metres they were represented only by *Tetillæ* and *Holtenia Carpenteri*. The latter species approaches much nearer the surface in the Mediterranean than in the Atlantic; we have ascertained its existence at 307 metres off Toulon; and in this zone it occurs with certain representatives of the littoral fauna, such as *Polymastia mamillaris* and *Tethya lyncurium*.

It results from our investigations that the Mediterranean must not be regarded as forming a distinct zoological province; we believe that this inland sea has been populated by the immigration of animals coming from the ocean. These, finding in this recently-opened basin * a medium favourable to their existence, established themselves in it definitively; and often their development and reproduction have taken place more actively than in their original locality. Near the shores especially the fauna exhibits a luxuriance which the other European coasts rarely present. One can easily understand that some of these animals, placed under novel biological conditions, have become slightly modified in size or in other external characters, which explains the slight differences existing between certain oceanic forms and the corresponding Mediterranean forms. If the primordial separation of the two faunas has been accepted, this is because the productions of the Mediterranean were compared with those of the North Sea, the English Channel, or the coasts of Brittany, whilst those of Portugal, Spain, Morocco, and Senegal ought to have been selected as terms of comparison. The animals of these regions must, in fact, have been the first to emigrate towards the Mediterranean; and in proportion as we know these faunas better, we see the differences which zoologists thought they could observe between them gradually disappear.

The explorations that we had made in the Mediterranean during the month of July necessitated some complementary researches in the Atlantic, especially on the coasts of Spain and Portugal; and the Minister of Marine authorized us to continue our dredgings on board the 'Travailleur' during the month of August.

In the abyssal parts of the Atlantic, the bottom, instead of being uniformly covered by a thick bed of ooze, was of a very varied nature, and formed sometimes of compact limestone, sometimes of pebbles resembling Pyrenean rocks in their

* See, as to the period of the formation of the Mediterranean, Blanchard, "La Géographie enseignée par la nature vivante" (Bull. Assoc. Sci. France, July 7, 1878, p. 200).

composition, sometimes of Nummulitic limestone, and sometimes of an ooze almost exclusively composed of Foraminifera*. Near the northern coast of Spain numerous and for the most part unknown Corals had been developed at certain points, and at depths of more than 1000 metres, with marvellous luxuriance, sheltering a whole population of Mollusca, Annelids, Crustacea, and Zoophytes. The dredgings that we made in these spots reached depths which had never been explored in European seas. On the 17th August, in the Bay of Biscay, in $44^{\circ} 48' 30''$ N. lat. and $7^{\circ} 0' 30''$ longitude west [of Paris], we dredged in a depth of 5100 metres, and met with numerous animals, of small size it is true, but some of them belonging to elevated groups, such as an Annelid, an Amphipod Crustacean, and three Ostracoda; the other species, which were very various, belong to the groups Foraminifera and Radiolaria. The temperature of the stratum of water that rested upon this bottom of 5100 metres was $3^{\circ} 5$ C. ($=38^{\circ} 3$ F.).

I have already said that generally the Fishes escaped our researches; nevertheless off the coast of Portugal, in sight of Cape Espichel, at about 1200 metres, we took three very rare species of sharks, which never seem to quit the abysses of the ocean, namely *Centrophorus squamosa*, *C. crepidalbus*, and *Centroscymnus caelelepis*, which were described a few years ago by MM. Barboza du Bocage and Brito-Capello. Another fish, *Mora mediterranea*, was also captured under the same circumstances.

The collections of Crustacea are very abundant. *Lisognathus Thomsoni*, Norm., *Scyramathia Carpenteri*, Norm., and *Geryon longipes* were found at depths varying between 896 and 1225 metres. *Bathynectes longispina*, discovered by Stimpson off Guadeloupe, was met with by us off Cape Ortegal at about 900 metres. A Pagurid of the great depths seems to me to be identical with an American species (*Eupagurus Jacobii*, A. M.-E.)†.

The group Galatheidæ is numerously represented. In 1880 I indicated the existence of a *Galathodes* in the Bay of Biscay at 1950 metres‡. Another species was captured this year on

* M. Schlumberger has found 116,000 Foraminifera in 1 cub. cent. of this mud.

† This species is identical with *Parapagurus pilosimanus*, Smith.

‡ *Galathodes acutus*, A. M.-E.—The rostrum is slender, pointed, and as long as the inner antennæ. The carapace has two lateral spines, one at its anterior angle, the other, which is very small, behind the cervical groove. The second, third, and fourth segments of the abdomen are armed in the median line with a spine directed forward.

the north coast of Spain at 900 metres ; like the preceding, it is blind *.

An *Elasmonotus*†, also blind, found at 1068 metres off Oporto is very distinct from the four species of this genus which inhabit the American seas. A *Diptychus* also exists in European waters‡.

Pontophilus norvegicus, Sars, supposed to be peculiar to the northern seas, occurred, associated with the preceding species and with another unknown spinous *Pontophilus* §. A Macruran of the family Hippolytidæ must form a new genus||. Its eyes have no corneas, and are terminated by three small spines. The genus *Acanthephyra*, of which I have described several species from the West-Indian seas, has a representative ¶ in the abysses of the ocean off the Berlingues at 2590 metres. Its colour, like that of the *Gnathophausia*, is a magnificent carmine red. A *Pasiphaë* which the dredge brought up from 900 metres presented exactly the same coloration. Among the most important acquisitions made in these same

* *Galathodes rosaceus*, A. M.-E.—The rostrum is broad and lamellar, and terminates anteriorly in three points, of which the median one is keeled above, and the lateral ones very short. The sides of the carapace are armed with four spines. The segments of the abdomen are rounded above. The arm and forearm of the chelæ bear a few spines; the hands are unarmed; the colour is rosy.

† *Elasmonotus Vaillantii*, A. M.-E.—This species is well characterized by the arrangement of the gastric region, which is much elevated, and bears in front two small symmetrical points dominating the rostrum. The latter is short, simple, and pointed. The abdomen is keeled transversely, and armed upon the first two segments with a median projection bearing two little spines.

‡ *Diptychus rubrovittatus*, A. M.-E.—This species differs from *D. nitidus* by its smaller eyes, its more widened and shorter carapace, its more triangular and less slender rostrum, and its stronger and more stumpy chelæ. Its colour is purplish rosy, marked on the chelæ with lighter bands. (Brought up from a depth of 900 metres.)

§ *Pontophilus Jacqueti*, A. M.-E.—The body is larger and more thick-set than that of *P. norvegicus*; its rostrum is shorter and does not reach to the level of the corneæ. A single median spine exists upon the carapace above the anterior cardiac lobe; two other lateral spines appear in front of this. Lastly the branchial lobe also bears a spine.

|| *Richardina spinicincta*, A. M.-E.—The rostrum scarcely passes beyond the basal joints of the outer antennæ; it bears twelve teeth above, and five below. The carapace bears, in front, on each side of the gastric region, three small spines, and a cincture of spicules behind the cervical groove. The feet of the first two pairs are didactyle; those of the last two pairs are multiarticulate and monodactyle.

¶ *Acanthephyra purpurea*, A. M.-E.—The rostrum is slender, nearly straight, and bears nine teeth on its upper and five on its lower margin. The third segment of the abdomen is armed with a median posterior point directed backward. Another similar, but smaller, point exists on the fifth and the sixth segment.

regions I may note a Pycnogonidan living at 1918 metres, and remarkable for its size*; with the legs extended it measured 0.25 metre. In its external characters it greatly approaches *Colossendeis leptorhynchus*, Hœck. It is the giant of the Pycnogonidæ of our seas.

The Mollusca were very numerous represented to the north of Spain; and several species were new. The subjoined list† will give a faint idea of this fauna; for the picking-out of the smaller species is not yet completed.

The Bryozoa form a notable proportion of the animals that we have found upon rocky and pebbly bottoms. Twenty-seven species belonging to known genera, and ten which must be placed in new genera, have already been recognized by Dr. Jullien. Interesting facts arise out of their investigation. *Setosella vulnerata* presents ovicells only in the great depths of 1000 metres; nearer the surface, whether in the Mediterranean or near the Shetlands, it seems to be unable to reproduce. Another species of the same genus, *S. Richardii*, is distinguished by the unicellular arrangement of the zoarium. We may also indicate *Anarthropora monodon*, Busk, *Mucronella abyssicola*, Norm., *Schizoporella unicornis*, and *Mucronella Peachii*, Johnst., which had not been previously met with in these regions, and appeared only to exist either on the Shetland coasts or in the American seas.

The collection of Coralliaria is especially remarkable for the abundance and beauty of the specimens belonging to the genera *Lophohelia* and *Amphihelia*. *Lophohelia prolifera* was dredged at about 1000 metres. *Amphihelia oculata* was obtained from the same station, as well as *Amphihelia rostrata*, Pourtales, previously known only in the West-Indian sea.

* *Colossendeis Villegentii*, A. M.-E.—The rostrum is shorter than that of *C. leptorhynchus*; but the body is longer.

† PTEROPODA: *Cuvieria*, *Spiralis*, *Hyalæa*, *Cleodora*, &c. GASTEROPODA: *Murex Richardi*, sp. n., *Trophon vaginatus*, *Columbella acute-costata*, *Marginea clandestina*, *Hela tenella*, *Trochus gemmulatus*, *Trochus Vaillantii* (affinis *T. Ottoi*, Philippi, from the Tertiaries of Sicily), *Zizyphinus Folini*, sp. n., *Turbo filiosus* (identical with those from the Sicilian Tertiaries), *Solarium discus*, *Pyramidella mediterranea*, *Actæon exilis*, *Scaphander punctostriatus*. SCAPHOPODA: *Siphonentalis quinquangularis*, *Dentalium agile*. LAMELLIBRANCHIATA: *Spondylus Gussoni*, *Lima Marionis*, sp. n., *Amusium lucidum*, *Pecten vitreus*, *P. Hoskynsi*, *Limopsis aurita*, *L. minuta*, *Arca nodulosa*, *Nucula sulcata*, *Malletia obtusa*, *M. cuneata*, *Neera rostrata*, *N. striata*, *Axinus ferrugineus*, *A. biplicatus*, *Lyonsia formosa*, *Syndesmya longicallus*, &c. BRACHIOPODA: *Terebratella septata*, *Terebratulina tuberosa*, *T. caput-serpentis*, *Terebratula sphenoida*, *Terebratula* sp. (a very large species, of the size of *T. Wyvillei*, Davidson, from the Antarctic seas, and very nearly allied to *T. scilla* from the Pliocene of Southern Italy), *Rhynchonella sicula*.

M. Marion indicates further a series of *Desmophyllum cristagalli*, and two new species of Caryophyllians—one that must be ranged among the true *Caryophylliæ*, while the other takes its place in the group of the *Bathycyathi*. The Hydroids, everywhere feebly represented, belong to northern forms (*Dicoryne flexuosa*, Sars, *Lophotænia tenuis*, Sars). A species of *Aglaophenia* (*A. Folinii*) is new.

Among the Vermes we may indicate some fine Sipunculians belonging to North-Atlantic types (*Ocnosoma Steenstrupi*, *Sipunculus norvegicus*). A *Phascolion* and an *Aspidosiphon* will have to be carefully compared with the species recently described by the naturalists of Christiania.

The Chaetopod Annelids are not rare. One of the most remarkable is a large blind *Eunice* (*Eunice amphihelice*, Marion) found in a parchment-like tube, around which was developed a fine polypary of *Amphihelia oculata*. We may mention further a fine *Aricia* allied to *A. Kupferi*, Ehl., a *Euphrosyne*, a *Terebella*, an Amphoretian, a *Nereis*, species of *Polynoë*, and a *Vermilia*, the tube of which is attached to *Lophohelice*.

All the Alcyonaria possess great interest. There are:—
1. *Funiculina quadrangularis*, Pall.; 2. *Pennatula aculeata*, Kor. & Dan.; 3. *Kophobelemnion stelliferum*, Müller; 4. *Umbellula ambigua*, Marion*, a very curious species, which closely approaches *U. grandiflora*, Köll., from Kerguelen's Land; 5. *Plexaura desiderata*, Marion, found at 1094 metres, and not yet described; 6. *Muricea paucituberculata*, Marion; 7. *Isis (Mopsea) elongata*, Esper; 8. Two very curious Gorgonidæ, the intermediate characters of which are very remarkable and which belong to new types.

The Echinodermata are very numerous; and among these animals the Stellerida possess a very marked predominance. The dredge brought up numerous fragments of *Brisinga*, and even a perfect example of this fine sea-star. M. Perrier has ascertained that the arms undergo metamorphoses with age; and their study proves that the genus *Hymenodiscus* is intimately related to the *Brisingæ*.

Among the new species of Asteroiidae we may indicate two *Pedicellasteres* (one with five, the other with six arms), and a very remarkable small sea-star which must form a genus under the name of *Hoplaster spinosus*, Perrier. The Ophiu-

* This species differs from *Umbellula Thomsoni* by having its sarcosoma destitute of calcareous sclerites. The polyps are grouped, without any bilateral arrangement, upon a large inflation; there is no rhachis. The axis at its upper extremity forms a very wide and twisted lamina, so as to throw out all the polyps in a pendent bunch.

ridæ are represented by the genera *Ophioglypha*, *Ophioderma*, *Ophiacantha*, *Ophiothrix*, *Amphiura*, and *Asteronyx*. A species remarkable for its short and raised arms was previously unknown; it was found at 390 metres, and has been designated *Astrophis pyramidalis*. We may also cite numerous examples of *Phormosoma*, which seem to belong to two species—one identical with *Phormosoma hystrix*, Wyv. Th., and another that we found last year in the Bay of Biscay.

Sponges were collected in great numbers; most of them, captured at more than 1000 metres, belong to the type Hexactinellidæ. We cannot here furnish a complete list of them. We may indicate several *Farrea*, *Aphrocallistes Bocagei*, *Holtenia Carpenteri*, *Sympagella nux*, *Hyalonema lusitanicum*, *Pheronema Carpenteri*, and a magnificent specimen of *Asconema setubalense*. Two fine specimens of *Euplectella suberea* were taken off the Berlingues at 3307 metres; a little further north the dredge brought up a new species allied to the *Fieldingia*, which has been named by M. Vaillant *Parafieldingia socialis* *.

In samples of the bottom from the Mediterranean M. Certes was unable to find any Infusoria; a sounding taken in the ocean at 1145 metres furnished him with an organism which may belong to that group and with a fine *Euglypha* of elongated form, resembling both in form and structure the freshwater *Diffugia* described by Dr. Leidy.

In a report so brief as this I have only been able to indicate the most remarkable results acquired for science by the expedition of the 'Travailleur.' It is possible, however, now to form some idea of the numerous materials for study that we have collected; and it may be asserted, without fear of contradiction, that one could not now hope to gather so ample a harvest of new facts by exploring with ordinary means even the most distant regions of the globe. These submarine explorations promise still further revelations; and we must continue them. It will not do for France to leave to others the care of studying the depths of the seas which bathe her shores; it is a task that belongs to her, and she must make its accomplishment a point of honour.

* The spherical spicular aggregations, instead of being enclosed in a spiculosarcodic tissue, as in the *Fieldingia*, are contained in a loose felted mass composed of long acicular sclerites.